

**U. S. DEPARTMENT OF ENERGY
WORK BREAKDOWN STRUCTURE DICTIONARY
PART II - ELEMENT DEFINITION**

1. PROJECT TITLE/PARTICIPANT Environmental Management/Paducah Remediation Services, LLC (PRS)		2. DATE 6/29/07	3. IDENTIFICATION SITE Paducah Project DOE Portsmouth/Paducah Project Office (PPPO)
4. WBS ELEMENT CODE 04.11.10.09		5. WBS ELEMENT TITLE Outyear Groundwater Off-site Plume Action	
6. INDEX LINE NO. N/A	7. REVISION NO. AND AUTHORIZATION Rev 1		8. DATE 6/24/08
9. APPROVED CHANGES N/A			
10. SYSTEM DESIGN DESCRIPTION N/A		11. BUDGET AND REPORTING NUMBER N/A	
12. ELEMENT TASK DESCRIPTION THIS IS A PLANNING LEVEL WBS DICTIONARY <u>WBS STRUCTURE</u> <ul style="list-style-type: none"> • WBS 04.11.10.09.01 Groundwater Off-site Plume Action Subproject Management • WBS 04.11.10.09.04 Remedial Design Work Plan • WBS 04.11.10.09.05 Remedial Design Report • WBS 04.11.10.09.06 Remedial Action Work Plan • WBS 04.11.10.09.07 Remedial Action • WBS 04.11.10.09.08 Remedial Action Completion Report • WBS 04.11.10.09.09 Dissolve Phase Plume Treatability Study • WBS 04.11.10.09.10 Dissolve Phase Plume Decision Documents • WBS 04.11.10.09.11 Remedial Investigation/Feasibility Study • WBS 04.11.10.09.12 Routine Well Sampling <u>INTRODUCTION</u> <p>In 1988, widespread contamination of groundwater by trichloroethene (TCE) and technetium-99 (Tc-99) around the Paducah Gaseous Diffusion Plant (PGDP) was detected. In 1993 an CERCLA engineering evaluation and cost analysis was approved and established a Water Policy to protect the public from using impacted groundwater by supplying public water. In 1995 and 1997, interim measures were taken to contain the high concentration areas of the Northwest and Northeast Plumes by removing contaminant mass. The interim measures included installation of two groundwater pump and treatment systems, one each at the Northwest and Northeast Plumes. In addition to the interim actions, remedial investigations (RIs) were performed to determine the extent of groundwater contamination at PGDP. These investigations included the Phase I, Phase II, Phase III and Phase IV Site Investigations which were performed in the early 1990s. A number of Waste Area Group Remedial Investigations were performed in the late 1980s and early 1990s. In addition to the above RIs, remedial investigations were performed on three waste area groups (WAGs). Those WAGs included WAG 6, WAG 27, and WAG 3/8/28. Also two site investigations were performed that collected information on the contamination in the SW Plume and near the C-746-S & T Landfill complex. Results of these many investigations detected the presence of dense non-aqueous phase liquid (DNAPL) onsite and up to three dissolved-phase plumes (northeast, northwest, and southwest) outside the facility fenceline. As a result of the RIs and baseline risk assessment performed for the Groundwater Operable Unit (GWOU), the following groundwater problem statements have been developed.</p> <ul style="list-style-type: none"> • TCE exists as DNAPL in three main areas C-400 Building, C-720 Building, and C-474-C Oil Landfarm. This organic compound is found in both the Upper Continental Recharge System 			

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<p>(UCRS) and the Regional Gravel Aquifer (RGA) at the C-400 (decontamination) Building and in the UCRS at the C-720 Building and C-474-C Oil Landfarm. In addition to the areas just mentioned, the SWMU 4, Chemical Burial Ground also was identified as having DNAPL present in the UCRS and RGA and releasing TCE contamination to the SW Plume. The mass of TCE in these areas must be reduced, removed, or contained before it is possible to return the groundwater to beneficial use and discontinue the source dissolving into the groundwater plumes.</p> <ul style="list-style-type: none">• TCE and its degradation products exist at lower concentrations throughout the plumes both on and off U.S. Department of Energy (DOE) property. These dissolved concentrations need to be reduced or otherwise contained before the groundwater at or around the PGDP can be brought back to beneficial use.• Dissolved-phase TCE and Tc-99 are discharging to surface water in Little Bayou Creek in the off-site area. These releases may need to be contained or eliminated to remove direct contact risks to human health and the environment. <p>To address these problems DOE has developed a remedial strategy for PGDP to stop plume growth and continued migration of contaminants and to reduce the concentration and volume of contaminants. The strategy includes employing various technologies as an early action, source area actions, fenceline actions, dissolved-phase plume actions, and institutional control action. The Dissolved-phase plume action addresses the remediation of the three dissolved TCE and Tc-99 plumes inside and outside the facility fenceline. This element includes the development, implementation and testing of an emulsified vegetable oil biobarrier in a treatability study should aerobic degradation of TCE not be sufficient to support monitored natural attenuation for total remediation.</p> <p>The use of a biobarrier is believed to be necessary if the testing and analysis being performed as part of other Dissolved-Phase Plume elements (KRCEE TCE Degradation Project) fails to determine that natural systems are degrading the TCE and other volatile contaminants naturally and at a sufficient rate as to rely on for total remediation. The biobarrier will be performed as CERCLA treatability study that will include a treatability study work plan, construction of the barrier, evaluation of the results, and development of a report containing the testing results.</p> <p>If the proposed <i>in situ</i> bioremediation technique is determined to be unsuitable to support the a remedy selection of monitored natural attenuation alone, then additional testing of an enhancement to the degradation mechanism present will be proposed and implemented. If effective, the <i>in situ</i> bioremediation technique will become a portion of the groundwater strategy to support implementation of MNA to demonstrate to the regulatory agencies that an appropriate MNA final remedy for the dissolve-phase TCE contamination plumes can be implemented. The implementation of MNA will provide a basis for allowing DOE to discontinue current operation of the NW and NE Interim Remedial Actions.</p> <p>Along with the treatability study testing and as a result of regulatory negotiations, a remedial investigation and feasibility study will be performed prior to selecting additional remedial measures. The remedial investigation will be designed to collect additional data to support the evaluation of the dissolved phase plume remedies. The results of the RI/FS will be utilized along with the development of CERCLA proposed plan and records of decision documents to select and document the implementation of remedial measures. These documents will developed to be consistent with CERCLA and the Paducah FFA.</p> <p>After remedial actions are selected and documented with signed records of decision, the remedial measures will be designed and then implemented. The design phase will include remedial design work plan, remedial action work plan and a 30%, 60%, 90% and certified for construction design phases. Following field completion of the remediation, the remedial measure and the results of its implementation</p>		

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will be documented in a remedial action completion report. The design and implementation documents will be developed consistent with CERCLA and the Paducah FFA.

LOGIC RELATIONSHIPS

Interfaces:

Internal to Contractor

- All contractor project managers and staff
- All subcontractors

External to Contractor

- DOE Portsmouth/Paducah Project Office and support contractors
- DOE Headquarters or other DOE sites (if applicable)
- U.S. Environmental Protection Agency (EPA)
- Commonwealth of Kentucky (KY)
- Site tenants including United States Enrichment Corporation (USEC); Uranium Disposition Services, LLC; and Swift and Staley Team (SST)
- USEC services in the area of property, information technology, radios, etc.
- SST, particularly in the areas of property management, information technology, and security
- Nevada Test Site (NTS): Profiling and disposition of newly generated and classified and fissile low-level waste (LLW), if required or applicable
- EnergySolutions: Profiling, treatment, and disposition of mixed and LLW, if required or applicable.
- Toxic Substances Control Act (TSCA) Incinerator, if required or applicable
- Commercial treatment, storage, or disposal facility: For treatment and disposal of non-radioactive hazardous waste, if required or applicable
- Kentucky Research Consortium for Energy and Environment
- Stakeholders
- Citizens Advisory Board and supporting contractor John Edward Holmes, Inc. (EHI)
- DOE Integrated Safety Management System (ISMS) Verification Team
- Other nonregulatory key interfaces

Time Sequencing with Other Work:

- The planning, implementation, evaluation, and report preparation for a emulsified vegetable oil biobarrier are stand-alone tasks that should not require significant coordination or sequencing with other work with the exception of other MNA evaluation work.
- All aspects of the evaluation of natural attenuation—work plan preparation and approval, data collection, and data evaluation—must be completed consistent with the project schedule so that there are no negative impacts to the preparation of the decision documents. The critical elements include the Dissolved-Phase Plumes Evaluation and the Dissolved-phase Plumes Evaluation Report.
- Remedial design subproject tasks includes development of the remedial design work plan and report. This scope will be completed prior to proceeding with the remedial action subproject task.
- Remedial action subproject tasks include development of the remedial action work plan, operations and maintenance plan, remedial action construction, operations, and post-construction report.
- Newly generated waste management will be handled during the construction and operation scope of the project.
- DOE prime subproject includes funding for disposal of waste generated by this project.

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<u>SCOPE DESCRIPTION</u>		
<p>The objective of this subproject is to perform an environmental investigation, evaluate and select, design and perform remedial action(s), such as C-Sparge™ technology, on the offsite plume areas of the GWOU and to attain agreed to remedial goals or cleanup levels. The GWOU consists of the three groundwater plumes on and offsite of PGDP and any sources associated with the plumes. This element will perform investigation and remedial activities in support of the portion of the Groundwater Plumes located onsite outside of the contaminant source areas including areas offsite of PGDP.</p>		
WBS 04.11.10.09.01 Groundwater Off-site Plume Action Subproject Management Provide overall management activities associated with this subproject. Activities performed under this subelement include the following:		
<ul style="list-style-type: none">• Perform technical, contractual, and project functions necessary to effectively manage and report scope, schedule, and budget.• Manage and transmit required documents to the Administrative Record.• Maintain all activities within the defined safety, environmental, and quality requirements.• Perform technical and personnel management functions.• Maintain technically qualified and properly trained personnel.• Develop, evaluate, and report project performance metrics.• Interface with DOE, KY, EPA, other prime contractors, and stakeholders, as needed.		
<p>The method(s) used for determining earned value for this WBS element is Level of Effort.</p>		
WBS 04.11.10.09.04 Remedial Design Work Plan The remedial design work plan (RDWP) will select the approach and schedule for designing the remedial action selected for the Dissolve Phase Plumes. It will include discussions of the design phases of the applicable design criteria and requirements, including the applicable ARARs for the project. The RDWP will also include the schedule for the completing the design and beginning field implementation within the 15 month CERCLA statutory requirement.		
<p>The RDWP is expected to include the development of the following versions of the document.</p> <ul style="list-style-type: none">• Complete D0, D1, and D2 RDWP		
<p>The method(s) used for determining earned value for this WBS element is Percent Completion.</p>		
WBS 04.11.10.09.05 Remedial Design Report The remedial design report (RDR) will include the development and publication of the 30%, 60%, 90% and CFC remedial designs for the remedial action. The designs will include both drawings and construction specifications necessary to implementing the action. Included within this element is the procurement of the necessary construction contractors to implement the selected remedial measure.		
<p>The major components included in this element are:</p> <ul style="list-style-type: none">• Complete Procurement of Remedial Design-Build Subcontract• Complete D0, D1, and D2 RDR• Issue Certified for Construction Design and Drawings• Certified for Construction approval		
<p>The method(s) used for determining earned value for this WBS element is Percent Completion.</p>		

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WBS 04.11.10.09.06 Remedial Action Work Plan

The Remedial Action Work Plan (RAWP) element will plan and document the field approach to implementing the selected remedial measure. This will include laying the phases of construction and the sequencing of the work to allow the action to be performed. The sequencing will be documented in a project schedule identifying at a minimum the mobilization, construction, shake-down and testing, operations and demobilization phases of activities.

The major components of this element include:

- Complete D0, D1, and D2 RAWP(s)
- EPA/KDEP approval of RAWP

The method(s) used for determining earned value for this WBS element is Percent Completion.

WBS 04.11.10.09.07 Remedial Action

This element will include the actual construction and operation of the remedial measure selected for the Dissolve Phase Plumes. Efforts will include the procurement phase, construction, shake-down, operations and demobilization phases. A verification phase to the remedial action will not be necessary to determine if the remedial measure is complete since the remedial measure is a long-term remediation utilizing C-Sparge technology.

The major components of this element include the following:

- Mobilize and execute Remedial Action Construction
- Complete D0, D1, and D2 Operations and Maintenance (O&M) Plan(s)
- Implement O&M

The method(s) used for determining earned value for this WBS element is Percent Completion.

Before beginning fieldwork, the project team must have an internal field review (IFR). For this IFR, the project team will put together a work package. This work package includes the following:

- Work instructions – includes hold points
- Training matrix and evidence of training
- UCD/USQD
- Lessons Learned
- Work authorization and work release from facility managers
- Procedures
- AHA
- Excavation/Penetration Permits
- RWP
- Team Meeting documentation
- Project Organizational Chart

In addition to the above, a Sampling Analysis Plan (SAP), Quality Assurance Plan (QAP), Waste Management Plan (WMP), and Health and Safety Plan (H&S) may be needed for any non-CERCLA actions.

For CERCLA actions, the appropriate FFA/CERCLA documentation will be required which will include SAP, QAP, WMP, H&S Plan, and other documents, as applicable to the action. These documents may require regulatory approval.

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The work package and other documentation are developed by personnel that charge to this project and also by personnel that charge to project support service center (i.e., QAP and RWP).

WBS 04.11.10.09.08 Remedial Action Completion Report

The remedial action completion report documents the completion of construction and the start of operation of the selected measure. It further identifies to the degree possible the time frame of operations that is expected to meet the necessary cleanup objectives.

The versions of the report expected for development include:

- Complete D0, D1, and D2 Remedial Action Completion Report

The method(s) used for determining earned value for this WBS element is Percent Completion.

WBS 04.11.10.09.09 Dissolved-Phase Plume Treatability Study

The treatability study will be composed of three main components. These components include the development of the work plan, the construction of the treatability study in the field along with the evaluation of its effectiveness, and finally a report drafted that includes the results of the treatability study.

A treatability study work plan will be developed for implementing testing to facilitate the selection and implementation of the Dissolved-Phase Plumes Remedy. A technical “desktop” study along with other available information from previous work will be used to evaluate the degradation capacity in the Regional Gravel Aquifer (RGA), and the most likely bioremediation technology or bioaugmentation technology to be successful in the PGDP groundwater environments will be included in this phase of work. The “desktop” study will be performed in an “Innovative Technology Remediation Deployment” fashion. It will utilize a team of subject matter experts in the field of MNA, bioremediation, and general groundwater remediation. The subject matter experts, for example, will represent DOE and EPA national laboratories, academia, and private contractors. Information made available from earlier work coordinated by the KRCEE TCE Degradation Project Team will also be utilized as appropriate. The purpose of the “desktop” study will be to assess the existing PGDP information and to allow the subject matter experts to evaluate the information and to assist in developing an implementation path forward that will have the greatest likelihood of generating acceptance of a MNA remedy. A demonstration to determine the effectiveness of the technology most likely to be successful (such as an emulsified oil biobarrier, or cometabolic bioremediation, or bioaugmentation materials) will be proposed. If successful, the technology likely will be proposed to augment MNA as a potential final remedy for the dissolved-phase plumes. Emulsified oil biobarriers are low-cost, permeable reactive barriers (PRBs) that promote the biodegradation of contaminants as groundwater flows through the barrier. The oil biobarrier functions in the same manner as other TCE targeting PRBs such as mulch and/or zero valiant iron walls that typically are installed for shallow aquifer treatments using trenching technologies. This element will include the development of D-1, D0, D1, and D2 Treatability Study Work Plan documents.

The evaluation phase of the work will include construction of treatability studies in the RGA for the selected (most favorable) technologies. The results of these treatability studies will be used to support MNA in the remedial decision documents included in other elements of this subproject baseline. The treatability field study is assumed to include construction of 14 injection wells to study and augment bioremediation methods selected in the work plan phase. Along with the injection wells will be a 16-

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<p>well monitoring network that will be monitored weekly and monthly for 15 months to ascertain the success of the technologies studied. The bioremediation test for baseline estimating purposes is assumed to be installed by injecting bioaugmenting materials (such as emulsified vegetable oil) into the subsurface using drilled permanently installed injection points spaced approximately 50-ft apart over a distance of 700 ft. Adjustments to the testing approach identified in the desktop study will be incorporated into the work plan, as necessary. This may include incorporating a separate treatment mechanism into the test along with the biobarrier technology. The bioaugmenting materials will be distributed readily throughout the aquifer matrix by injecting a dilute solution of the substrate to cover a design radius of influence and create a contiguous biobarrier. Following injection, the bioaugmenting materials preferentially will adhere to the aquifer matrix rendering the carbon source relatively immobile. The increased bioremediation resulting from the injected material chosen is estimated to last from two to five years; therefore, the need for frequent injections is eliminated, which is not the case for some injection materials such as lactate only solutions that are not expected to be selected for use in this test. The bioaugmentation materials will be washed downgradient of the injection area to a small degree and will continue to promote biodegradation processes and aid in the demonstration of MNA for plume control. Bioaugmentation using a dechlorinating culture capable of completely degrading TCE and its daughter products also may be added to the barrier once anaerobic conditions are confirmed to ensure the effectiveness of the biobarrier. Dehalococcoides (DHCs) are the only species of microorganisms identified that have the capability to completely dechlorinate TCE and its daughter products [dichloroethene (DCE) and vinyl chloride (VC)] to ethene.</p> <p>The baselined/proposed 700 ft. biobarrier will be installed upgradient of the DOE property boundary in one of the three groundwater plumes. Due to potential irreversible changes to the RGA, the site for the testing will be carefully considered so as not to impact existing interim actions. The barrier will promote the biodegradation of TCE and its daughter products along the barrier, thereby enhancing our ability to demonstrate natural attenuation and plume control. The success of this demonstration will facilitate data collection as well as provide additional justification for the shutdown of the pump-and-treat systems comprising the interim remedial actions for the Northwest and Northeast Plumes. It is anticipated that by coupling expertise in the evaluation of natural attenuation along with removing a large portion of the source area at C-400 and the positive results of this treatability study, an appropriate MNA final remedy can be successfully negotiated with the regulatory agencies and other stakeholders.</p> <p>The evaluation report will provide the data analysis for the information obtained in the remedy-evaluation phase. The information collected will evaluate the groundwater and operational data to further allow the selection of the single most promising technology from the technology(ies) tested to support MNA type remedial decision. Included in the evaluation report will be groundwater modeling and contaminant transport modeling necessary to support the further selection of MNA in the proposed plan (PP) and record of decision (ROD) phases of the project under another WBS element.</p> <p>The method(s) used for determining earned value for this WBS element is Percent Completion.</p> <p>Before beginning fieldwork, the project team must have an internal field review (IFR). For this IFR, the project team will put together a work package. This work package includes the following:</p> <ul style="list-style-type: none">• Work instructions – includes hold points• Training matrix and evidence of training• UCD/USQD• Lessons Learned• Work authorization and work release from facility managers• Procedures		

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<ul style="list-style-type: none">• AHA• Excavation/Penetration Permits• RWP• Team Meeting documentation• Project Organizational Chart <p>In addition to the above, a Treatability Study Work Plan, Sampling Analysis Plan (SAP), Quality Assurance Plan (QAP), Waste Management Plan (WMP), and Health and Safety Plan (H&S) may be needed for the studies.</p> <p>For CERCLA actions, the appropriate FFA/CERCLA documentation will be required which will include SAP, QAP, WMP, H&S Plan, and other documents, as applicable to the action. These documents may require regulatory approval.</p> <p>The work package and other documentation are developed by personnel that charge to this project and also by personnel that charge to project support service center (i.e., QAP and RWP).</p> <p>WBS 04.11.10.09.10 Dissolve Phase Plume Decision Documents</p> <p>The decision documents element will include two phases of development in documenting the remedial action selected.</p> <p>The Proposed Plan document will be developed consistent with the data collected from the supporting documents for the SW Plume including the MNA Report, Site Investigation, Dissolved Phase Remedial Investigation and Feasibility Study, etc. The PRAP will be developed utilizing the requirements of the PGDP FFA and CERCLA. The PRAP is expected to undergo a 45-day public comment period as required in the FFA.</p> <p>Following completion of the public review of the PP, the ROD will be developed that identifies and documents the selected remedial action(s). Comments received from the public review of the PP will be resolved and incorporated into the ROD. The ROD will include a summary level of the remedial alternatives considered during the selection process.</p> <p>Parallel with the ROD, the Land Use Control Implementation Plan (LUCIP) will be developed, reviewed and approved. The LUCIP, once completed, will be appended to the Land Use Control Assurance Plan for the PGDP site. The LUCIP will document the detail and placement of the institutional control measures, if any, that were documented as necessary in the approved record of decision.</p> <p>The major components of the element include the following documents.</p> <ul style="list-style-type: none">• Complete D0, D1, and D2 PP• Complete D0, D1, and D2 ROD/LUCIP <p>The method(s) used for determining earned value for this WBS element is Percent Completion.</p> <p>WBS 04.11.10.09.11 Remedial Investigation/Feasibility Study</p> <p>The resolution reached for the informal dispute for the Southwest Plume Site Investigation determined that a remedial investigation and feasibility study would be performed for the dissolved phase plumes. This baseline element includes the development of the components of those CERCLA elements including</p> <ul style="list-style-type: none">▪ RI scoping document		

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<ul style="list-style-type: none">▪ RI/FS work plan▪ RI report, and▪ FS report. <p>Also included in this element is the performance of the field work involved in the remedial investigation and any subsequent laboratory analysis performed on environmental samples collected during the RI. The documents will be developed consistent with the Paducah FFA and CERCLA and are expected to have multiple versions including D-1, D0, D1 and D2.</p> <p>The remedial investigation field effort is expected to collect information by obtaining soil samples, groundwater samples, installing monitoring wells and piezometers throughout the three plumes. The major components of the RI are expected to include:</p> <ul style="list-style-type: none">▪ SW Plume Distal Monitoring Wells – This will include the installation of 8 monitoring wells in the RGA in the downgradient portions of the SW Plume to monitor is migration pathway as it leaves DOE property.▪ Terrace, RGA and Creek Interface - This will include the installation of 4 UCRS and 4 RGA monitoring wells near the location of the surface creeks to assist in determining the hydrologic characteristic interactions with the terrace, RGA and subsurface.▪ Northwest Plume Distal Monitoring Wells – This will include the installation of 10 monitoring wells in the RGA downgradient portions of the NW Plume monitor the extreme ends of the plume as it interacts with the Ohio River and Little Bayou Creek.▪ Northeast Plume Distal Monitoring Wells – This will include the installation of 10 monitoring wells in the RGA downgradient portions of the NE Plume monitor the extreme ends of the plume as it interacts with the Ohio River and Little Bayou Creek.▪ Rubble Zone Monitoring Well System – This will include the installation of 6 monitoring wells installed deep in the McNairy and nested with RGA monitoring wells to assist with migrating contaminants that could impact the carbonate rubble zone.▪ Northwest Plume Migration Transects – This will include the installation of approximately 15 borings thru to the base of the RGA along with the collection of periodic groundwater samples in 10' depth intervals.▪ Creek Nesting & Gauging on Creeks – This will include the installation of approximately 12 monitoring wells screened at variable depths to determine the hydrologic characteristics of the creeks with the RGA and McNairy formation.▪ Little Bayou Creek Analysis – This will include the installation of monitoring wells and piezometers to monitor the hydrologic interaction of the Little Bayou with the subsurface. It will also include the installation of an estimated 4 soil borings to collect geotechnical conditions of the subsurface in the area of the Little Bayou Creek.▪ Northeast Plume Upgradient Source Analysis – This will include the installation of approximately 20 direct push soil borings to obtain water samples from the subsurface to assist in determining the source of the NE plume. This effort will also include 10 monitoring wells to monitor the source conditions of the plume.▪ C-616 Lagoon Monitoring System – This will include the installation of 12 nest monitoring wells screened at 3 elevations to allow for hydrologic and contaminant migration evaluation from the lagoon complex.▪ Northwest Centerline Well System – This will include the installation of 5 monitoring wells along the centerline of the plume to assist in monitoring contaminant migration and evaluation of natural attenuation through the plume.▪ Northeast Centerline Well System – This will include the installation of 5 monitoring wells along the centerline of the plume to assist in monitoring contaminant migration and evaluation of natural attenuation through the plume.▪ River Interface System(Ohio) – A system of 6 nested wells to monitor contaminant levels near the river and to also collect hydrologic information concerning the river, Little Bayou Creek and		

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RGA interactions.

The feasibility study will be developed utilizing the data collected from the remedial investigation and all other groundwater and geologic information available for the RGA. The approved Groundwater Operable Unit Feasibility Study from 2002 will be utilized to the extent practical for information concerning the available technologies for the dissolved phase plumes. The feasibility study will be developed consistent with CERCLA requirements and the requirements of the Paducah FFA.

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The work package and other documentation are developed by personnel that charge to this project and also by personnel that charge to project support service center (i.e., QAP and RWP).

WBS 04.11.10.09.12 Routine Well Sampling

Routine Well Sampling element will consist of a continued monitoring program that is expected to be required by the regulating community for the plume areas following the completion of remedial action(s) performed under separate WBS elements. This monitoring will be to determine the long term effectiveness of the remedial actions and to assist in preventing contaminant exposure due to the redevelopment of the contaminant plume over time should it occur. This element will include the continued monitoring once per year of 93 wells that will be analyzed for volatile organics and technetium the main contaminants contained in the three PGDP groundwater plumes. In addition to the sampling, this element also includes measuring water levels in 10 of the peizometers installed on a yearly basis.

The method(s) used for determining earned value for this WBS element is Percent Completion.

DELIVERABLES

WBS 04.11.10.09.01 Groundwater Off-site Plume Action Subproject Management

1. PROJECT TITLE/PARTICIPANT Environmental Management/Paducah Remediation Services, LLC (PRS)	2. DATE 6/29/07	3. IDENTIFICATION SITE Paducah Project DOE Portsmouth/Paducah Project Office (PPPO)
4. WBS ELEMENT CODE 04.11.10.09	5. WBS ELEMENT TITLE Outyear Groundwater Off-site Plume Action	
<u>Element Milestones:</u> <ul style="list-style-type: none">• None <u>Element Deliverables:</u> <ul style="list-style-type: none">• Paducah Contractor Quality Assurance Project Plan• Paducah Contractor environmental, safety, and health (ES&H) Plan• Provide input to the following reports and submittals (if applicable):<ul style="list-style-type: none">○ Monthly Project Performance Report○ Risk Management Plan Updates○ Site Management Plan (SMP)○ Semiannual Critical Analysis Report○ Presentations○ FFA briefings○ Labor Standards Determinations○ Gold Chart Performance Metrics○ Annual updates to Site Treatment Plan○ Annual Compliance Agreement Report○ Annual ISMS Update○ Annual Work Smart Standards Update○ Financial Reporting, Management Analysis Reporting System○ Annual Statement of Costs Incurred and Claimed○ FFA Semiannual Progress Report○ Remedial Action/Regulatory Commitment Tracking Report○ Other reports/documents, as necessary WBS 04.11.10.09.04 Remedial Design Work Plan <u>Element Milestones:</u> <ul style="list-style-type: none">• Approval of D2 Remedial Design Work Plan <u>Element Deliverables:</u> <ul style="list-style-type: none">• Remedial Design Work Plan D0, D1, and D2 versions WBS 04.11.10.09.05 Remedial Design Report <u>Element Milestones:</u> <ul style="list-style-type: none">• Approval of D2 Remedial Design Report <u>Element Deliverables:</u> <ul style="list-style-type: none">• Remedial Design Report D0, D1, and D2 versions WBS 04.11.10.09.06 Remedial Action Work Plan <u>Element Milestones:</u> <ul style="list-style-type: none">• Approval of D2 Remedial Action Work Plan <u>Element Deliverables:</u> <ul style="list-style-type: none">• Remedial Action Work Plan D0, D1, and D2 versions WBS 04.11.10.09.07 Remedial Action <u>Element Milestones:</u>		

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<ul style="list-style-type: none">• Offsite Plume Remedial Action Start Fieldwork <p><u>Element Deliverables:</u></p> <ul style="list-style-type: none">• Complete all waste disposal <p>WBS 04.11.10.09.08 Remedial Action Completion Report</p> <p><u>Element Milestones:</u></p> <ul style="list-style-type: none">• Approval of D2 Remedial Action Completion Report <p><u>Element Deliverables:</u></p> <ul style="list-style-type: none">• Remedial Action Completion Report D0, D1, and D2 versions <p>WBS 04.11.10.09.09 Dissolve-Phase Plume Treatability Study</p> <p><u>Element Milestones</u></p> <ul style="list-style-type: none">• Approval of D2 Dissolved-Phase Plume Work Plan• Dissolved-Phase Plume Evaluation Start Fieldwork• Approval of D2 Evaluation Report <p><u>Element Deliverables</u></p> <ul style="list-style-type: none">• Dissolved-Phase Plume Work Plan D2 version• Complete Waste Disposal• Dissolved-Phase Plume Evaluation Report D0, D1, & D2 versions <p>WBS 04.11.10.09.10 Dissolve Phase Plume Decision Documents</p> <p><u>Element Milestones:</u></p> <ul style="list-style-type: none">• Approval of D2 PP• Approval of D2 ROD/LUCIP <p><u>Element Deliverables:</u></p> <ul style="list-style-type: none">• Proposed Plan D0, D1, and D2 versions• ROD/LUCIP D0, D1, and D2 versions <p>WBS 04.11.10.09.11 Remedial Investigation/Feasibility Study</p> <p><u>Element Milestones:</u></p> <ul style="list-style-type: none">• Approval of D2 RI Work Plan• Approval of D2 RI Report• Approval of D2 FS <p><u>Element Deliverables:</u></p> <ul style="list-style-type: none">• Remedial Investigation Work Plan D0, D1, and D2 versions• Remedial Investigation Report D0, D1, and D2 versions• Feasibility Study D0, D1, and D2 versions <p>WBS 04.11.10.09.12 Routine Well Sampling</p> <p><u>Element Milestones:</u></p> <ul style="list-style-type: none">• None <p><u>Element Deliverables:</u></p>		

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<ul style="list-style-type: none">• None		
<u>REQUIREMENTS</u>		
<ul style="list-style-type: none">• Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/National Contingency Plan• KY Hazardous Waste Permit (KY8-890-008-982)• FFA for the PGDP• SMP for the PGDP (annual revisions)• Applicable state and federal laws and regulations (applicable or relevant and appropriate requirements)• Contractor ISMS• UEO-1066, as updated, Lease Agreement between DOE and USEC, Revision 4, dated October 30, 2001• Enclosure to GDP 95-0018, as updated, USEC and DOE Resolution of Shared Site Issues, Revision 1, dated March 30, 1998• Applicable contractor plans, policies, and procedures.• Waste acceptance criteria (WAC) for all applicable treatment and disposal facilities that were in effect on April 24, 2006.• Applicable DOE Orders• Applicable Federal Acquisition Regulations		
<p>It is the core value of the Contractor that the safety and health of every worker, the public at large, and our environment are the most important assets that we are entrusted to protect. To accomplish this, an ISMS, based on DOE's ISMS, has been implemented that incorporates the five core functions and is based on the seven guiding principles. The objective of ISMS is to systematically integrate safety and environmental protection into the planning and execution of all work activities. The term safety encompasses Nuclear Safety, Industrial Safety, Industrial Hygiene, Occupational Health, Health Physics, and environmental issues. ISMS requirements flowdown to Contractor subcontractors. The five core functions are (1) define the scope of work, (2) analyze hazards, (3) develop and implement hazard controls, (4) perform work within controls, and (5) provide feedback and continuous improvement. The seven guiding principles are (1) line management responsibility for safety, (2) clear roles and responsibilities, (3) competence commensurate with responsibility, (4) balanced priorities, (5) identification of safety standards and requirements, (6) hazard control tailored to work being performed, and (7) operations authorization.</p>		
<p>Before a subproject begins, several activities must be completed that demonstrate that all involved in the project have completed rigorous health and safety reviews and that all potential hazards of doing the work have been identified. The routine activities in remedial actions are conducted in accordance with standard operating procedures, activity hazard analyses, and Integrated Safety Management plans. Nonroutine work will require a readiness assessment, as necessary, to ensure complete health, safety, and environmental reviews prior to work start. This assessment is conducted by people experienced in similar kinds of work with the right to examine all aspects of a project about to commence and requires that the project team provide documented evidence that any applicable requirements of the job have been met.</p>		
<u>SCOPE ASSUMPTIONS</u>		
<ul style="list-style-type: none">• Implementation and evaluation of a biobarrier (Emulsified Vegetable Oil Barrier) as a part of Dissolved-Phase Plume Remedy treatability study is acceptable to DOE and the Commonwealth of		

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<p>Kentucky and the EPA following determination of insufficient TCE degradation to support MNA.</p> <ul style="list-style-type: none">The scope of work within this subproject includes activities previously included in the baseline and agreed to with the regulators in the past that may not result in cost effective risk reduction. DOE is working to revise this subproject work consistent with the risk-based end state initiative. The baseline is a planning document, not a decision document. These actions are included at this time because the project has a reasonable expectation that this work will be required as a result of the CERCLA/FFA decision process. In the alternative, if a decision is made to reduce scope, a change to the baseline will be processed accordingly. In those cases where the project believes there is a reasonable expectation that no further action is required, the scope has been removed from the baseline. In the event the decision process requires work to be performed, a modification to the baseline will be processed accordingly.Dissolved-phase plume action would include C-Sparge™ treatment wells constructed within the high concentration cores of the dissolved-phase plumes. High concentration cores would be areas where either TCE concentrations exceed 100 µg/L or Tc-99 concentrations exceed 900 pCi/L.Plumes located outside the PGDP facility fenceline requiring remediation include the northeast, northwest, and C-746-S&T Plumes.A portion of the Northwest Plume inside the facility fenceline would require remediation.A total of 15 C-Sparge™ treatment wells would be required. This includes three C-Sparge™ wells each for the Northeast Plume, Northwest Plume inside the fenceline, and the C-746-S&T Plume, and six C-Sparge™ wells for the Northwest Plume outside the fenceline. Approximate depth of the treatment wells would be 120 ft.A total of 90 dual-port observation wells would be required to monitor the performance on the C-Sparge™ systems. This includes 18 dual-port wells each for the northeast, northwest inside the fenceline, and C-746-S&T Plumes, and 36 dual-port wells for the Northwest Plume outside the fenceline. Approximate depth of the treatment wells would be 120 ft.Source area and fenceline actions will be initiated prior to initiation of dissolved-phase plume actions.The primary driver is the RCRA/CERCLA process outlined by the FFA and SMP for PGDP.DOE funding will be available to perform the defined scope of work.EPA and KY will adhere to review times set forth in the FFA.All D2 documents will be approved as submitted; therefore, development of a D3 document will not be required. Major changes will not be required to any document as a result of reviewer comments. Major changes include, but are not limited to, complete section or chapter rewrites; the addition of new sections or chapters; complete figure, table, or map modifications; the addition of new figures, tables, or maps; changes to scientific modeling input parameters; and the use of scientific models other than those agreed in the Work Plans or Feasibility Studies.No Notices of Violation will be issued against this activity.Unexpected contaminants will not be encountered. Contaminants of concern include TCE and its degradation products cis1, 2-dichloroethene and vinyl chloride, and Tc-99.The Baseline Remedy for the GWOU does not include additional feasibility studies.All remedial actions will meet the requirements of CERCLA and the Secretarial Policy for addressing National Environmental Policy Act values as provided in the GWOU ROD.The Baseline Remedy for the GWOU will be composed of regional groundwater control and treatment, source area and off-site plume reduction via treatment and monitored natural attenuation of the offsite plumes.No additional characterization or investigation will be performed under this baseline.C-Sparge wells will be outfitted with ion exchange cartridges (retrievable) to capture the Tc99.		
COMPLETION CRITERIA		

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WBS 04.11.10.09.01 Groundwater Offsite Plume Action Subproject Management.

- Complete all technical and reporting requirements for the conduct and reporting of the Remedial Action.

WBS 04.11.10.09.04 Remedial Design Work Plan

- EPA/KY approval of D2 Remedial Design Work Plan

WBS 04.11.10.09.05 Remedial Design Report

- EPA/KY approval of D2 Remedial Design Report

WBS 04.11.10.09.06 Remedial Action Work Plan

- EPA/KY approval of D2 Remedial Action Work Plan

WBS 04.11.10.09.07 Remedial Action

- C-Sparge™ Treatment will be constructed and operable for five years
- All waste will be disposed of within one year of generation

WBS 04.11.10.09.08 Remedial Action Completion Report

- EPA/KY approval of D2 Remedial Action Completion Report

WBS 04.11.10.09.09 Dissolve Phase Plume Treatability Study

- Complete construction and O&M of biobarrier
- All waste will be disposed of within one year of generation
- EPA/KY approval of D2 Evaluation Report

WBS 04.11.10.09.10 Dissolve Phase Plume Decision Documents

- EPA/KY approval of D2 PP
- EPA/KY approval of D2 ROD/LUCIP

WBS 04.11.10.09.11 Remedial Investigation/Feasibility Study

- EPA/KY approval of D2 RI Work Plan
- EPA/KY approval of D2 RI Report
- EPA/KY approval of D2 FS

WBS 04.11.10.09.12 Routine Well Sampling

- Complete routine well samples

RISK MANAGEMENT

See Risk Management Plan for analysis.

Risk was mitigated through the following efforts:

- Continue to perform due diligence in all work activities to reduce the possibility of safety incidents.
- Perform due diligence to ensure that waste is properly packaged and that transportation conveyances are properly loaded.
- Follow waste characterization, packaging, transportation, and disposition procedures and plans.
- Ensure that documents are written professionally and accurately.
- Ensure that fieldwork is carried out safely and in accordance with work instructions.

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- DQOs will have qualitative and quantitative statements derived from the DQO Process that clarify study objectives, define the appropriate type of data, and specify the tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions and process knowledge.
- Ensure QA/QC procedures address potential system and equipment failures.
- Subcontractor will follow ALARA principles and approved decontamination procedures.
- Ensure engineering design planning and review processes meet or exceed a design's intent for implementation.

CERCLA AREAS AND SWMU

SWMU No.	Description
11	C-400 TCE Leak Site (GW)
1	C-747-C Oil Land Farm
211	C-720 TCE Spill Site Northwest
209	C-720 Compressor Shop Pit Sump (GW)
201	Northwest Groundwater Plume
202	Northeast Groundwater Plume
210	Southwest Groundwater Plume
533	TCE Spill Site from TCE unloading operations at C-400

BASIS OF ESTIMATE

1. Summary of Site Conditions

The MNA evaluation will be completed and the D1 Treatability Study Work Plan will be issued to the Regulators.

2. Estimating Methods

☐ Parametric ☐ Bottom-Up ☒ Other: Parametric & Bottom-Up

3. Sources of Estimating

Labor – Technical review of documents to be prepared determined the mix of labor required for document preparation. Echols & R.S. Means were used to determine craft types to be used for construction-type activities. Project team meetings were utilized to identify staff types to be used for other areas, such as sample collection and analysis, waste characterization and disposal, health and safety monitoring, etc.

Equipment – Echols & R.S. Means were two printed sources used to determine the types of equipment needed to conduct the work proposed. Experience from technical staff also provided input as to the type of equipment needed.

Materials – Same as equipment.

Other Direct Cost – Same as equipment.

Transportation – Same as equipment.

Subcontracts – Experience from technical staff provided requirements for the involvement of subcontracts.

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4. Basis of Estimate (Unescalated Values)
 See Detail Estimate.

WASTE VOLUMES

See attached waste performance metrics, as applicable.

PROJECT SCHEDULE

See attached schedule.

BASELINE BY YEAR

See attached Baseline by Year Report.